

# Obtaining population-wide inequality estimates for Switzerland by reweighting high-quality subpopulation tax data

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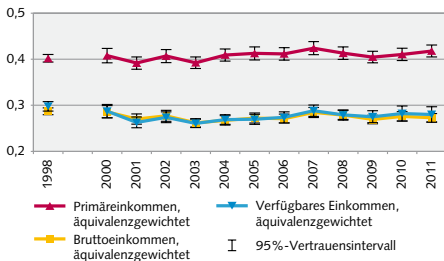
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# Inequality in Switzerland

- Income inequality increased in many OECD countries (OECD 2008, 2011, 2015; Salverda et al. 2014) .
- Switzerland: Results are ambiguous, depending on data source
  - ▶ Survey-based estimates indicate stable, or even decreasing inequality (e.g. Household Budget Survey).
  - ▶ Tax-data-based estimates indicate increasing inequality, in particular at the upper end of the distribution.

# Inequality in Switzerland

## Entwicklung der Gini-Koeffizienten 1998 bis 2011, Gesamtbevölkerung<sup>1</sup> G 6



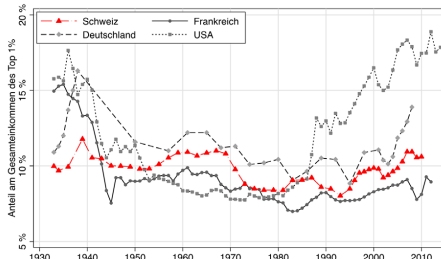
<sup>1</sup> Berechnungen einschliesslich der negativen Einkommen

Quelle: Haushaltsbudgeterhebung

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(Bundesamt für Statistik 2013)

Grafik 1. Einkommensanteil des Top 1% im internationalen Vergleich



(Martinez 2017)

# Survey data vs. tax data

- Survey data:

- ▶ Pros:

- ★ measurement of income based on theory-guided income definitions

- ▶ Cons:

- ★ strong middle-class bias, underrepresentation of the top and the bottom
    - ★ small sample sizes

- Tax data:

- ▶ Pros:

- ★ full census
    - ★ income and assets in great detail

- ▶ Cons:

- ★ measurement of income for administrative purposes; some components lacking (e.g. social assistance)
    - ★ tax subjects, not households
    - ★ little additional information
    - ★ difficult to obtain from all cantons of Switzerland

# Goal of this study

- We have access to high quality individual-level tax data from the canton of Bern. One of the advantages of this particular dataset is that households are identified.
- Can we use this dataset to estimate the level of inequality (in equivalized disposable income) in whole Switzerland?

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# Combination of different data sources

- Detailed tax data from canton of Bern (2012).
- Public tax statistics from the Federal Tax Administration (FTA).
- Various statistical indicators at the municipality level from the Federal Statistical Office (FSO).



# Bern tax data

- Good:
  - ▶ Enough details to construct desirable income measures (disposable income).
  - ▶ Individual level-data; (nearly) full census.
  - ▶ Linked with Federal Register of Buildings and Dwellings to identify household structures.
- Bad:
  - ▶ Only one canton (about 12% of the Swiss population)

# Tax statistics by the FTA

- Good:
  - ▶ Covers the complete population of Switzerland
  - ▶ Indicators (such as averages, medians, and Gini coefficients) at the municipality level
- Bad:
  - ▶ Inappropriate income measurement (taxable income)
  - ▶ Statistics are for “tax subjects”, not households or individuals
    - ★ e.g. married couple = 1 tax subject; unmarried couple = 2 tax subjects
  - ▶ Aggregate data

# Idea

- Use the FTA indicators (as well as other indicators from the FSO) to derive weights that can be applied to the tax data from Bern.
- The weights are constructed at the municipality level. The goal is to reweight the Bernese municipalities such that they look like Switzerland.
- These weights can then be used when analyzing the individual-level tax data from Bern.
- The procedure should work if there is enough heterogeneity among Bernese municipalities and if strong predictors for inequality at the municipality level are available.

# Method

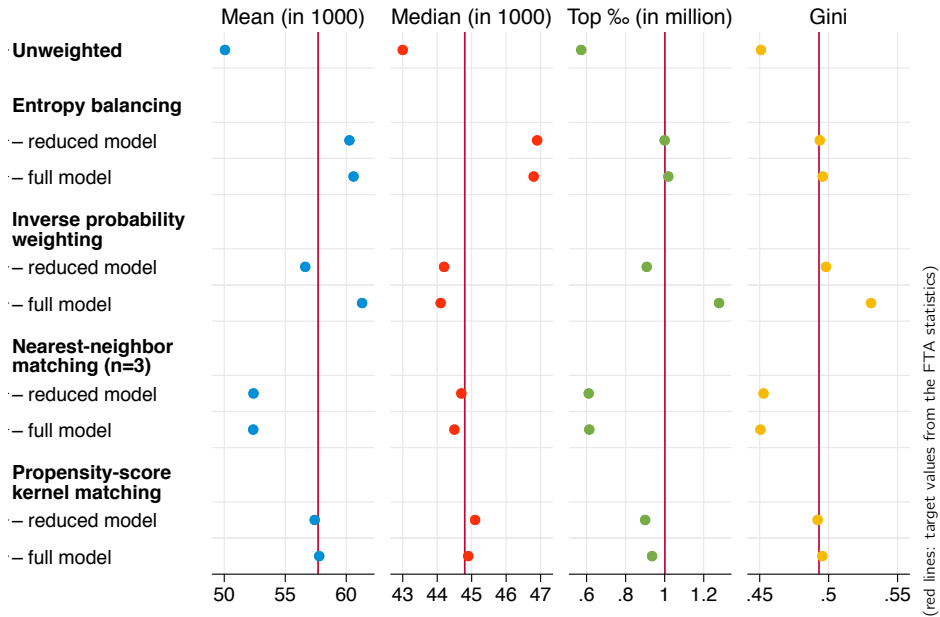
- We use various methods to compute the weights
  - ▶ Entropy balancing (Hainmüller 2012)
  - ▶ Inverse probability weighting
  - ▶ Nearest-neighbor matching
  - ▶ Propensity-score kernel matching (Jann 2017)
- Included variables (at the municipality level)
  - ▶ FTA indicators: average (pseudo-equivalized) taxable income, Gini coefficient of (pseudo-equivalized) taxable income
  - + population size, distribution of household sizes, age distribution (reduced model)
  - + economic structure of work force, proportion of welfare recipients (full model)

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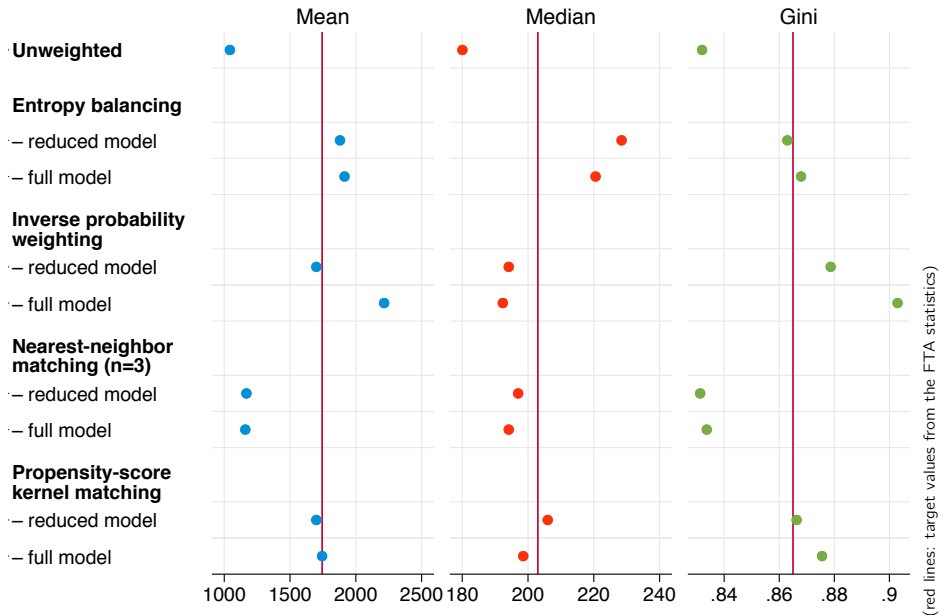
# Results

- In the following we first evaluate how the different methods perform.
- We use the distribution of (non-equivalized) taxable income as well as the distribution of federal taxes paid by Swiss tax subjects as benchmark.
- That is, we evaluate whether these FTA statistics can be successfully reproduced by the reweighted Bernese tax data.
- We then provide estimates of the inequality of equivalized disposable income in Switzerland based on the reweighted data.

# Taxable income

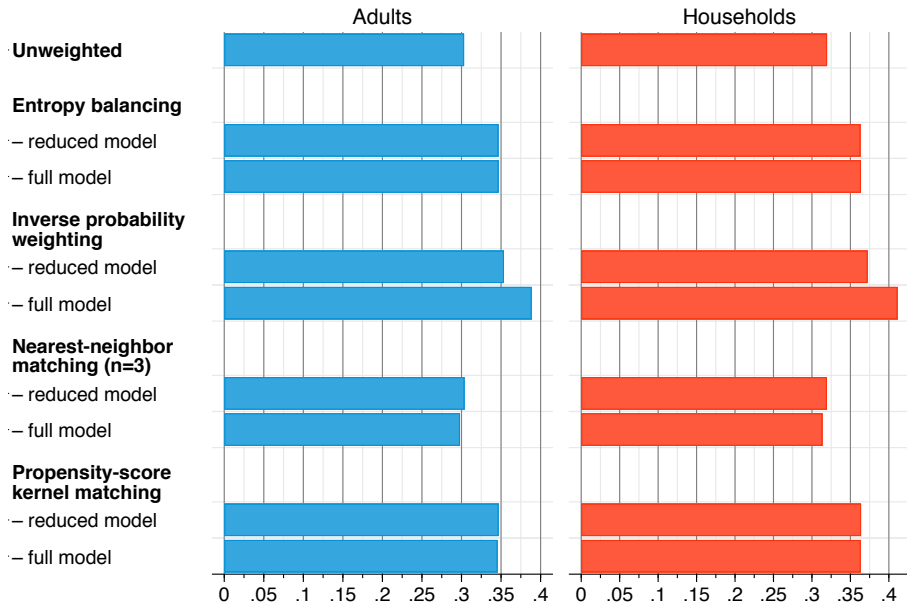


# Tax bill (federal tax)

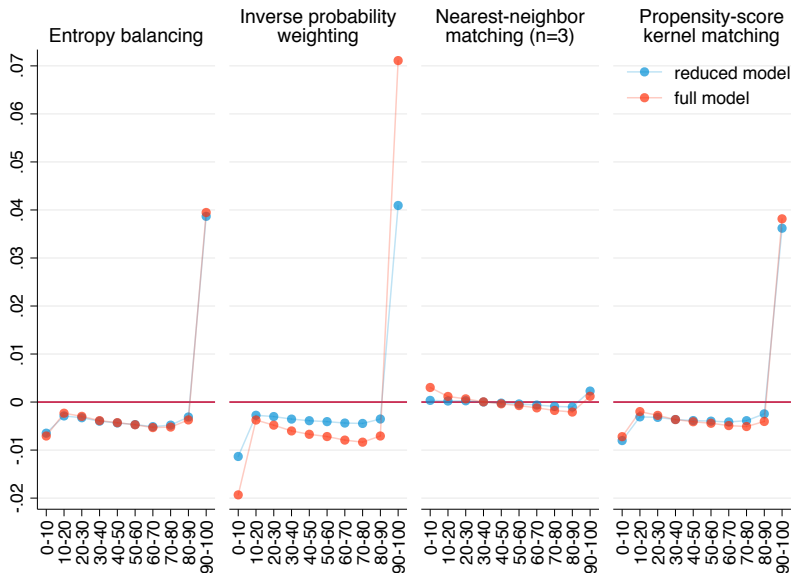




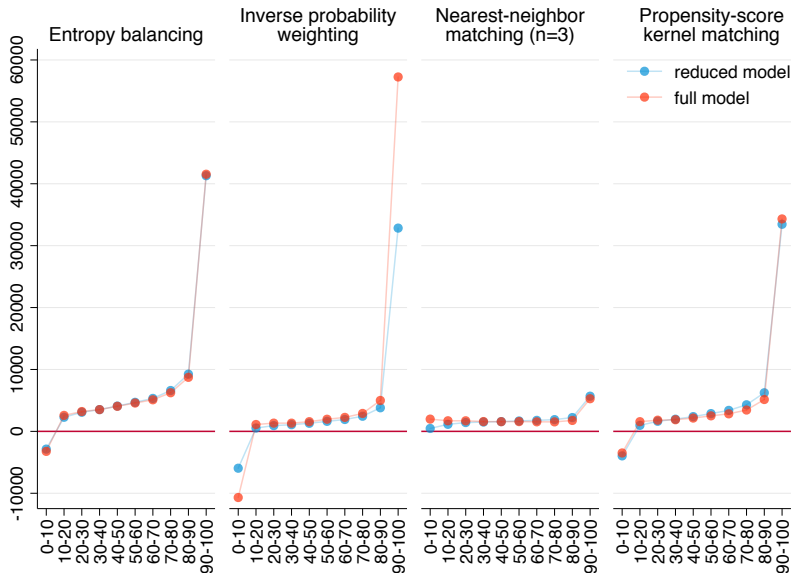
# Gini (equivalized disposable income)



# Difference in percentile shares between raw and reweighted data (equivalized disposable income):



# Difference in average equivalized disposable income by percentile group between raw and reweighted data:



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# Conclusions

- The approach seems promising as the benchmark statistics could successfully be reproduced.
- However, the details of the procedure to compute the weights matter: Entropy balancing and propensity-score kernel matching were successful, nearest-neighbor matching and inverse probability weighting were not.
- The resulting Swiss Gini coefficient of equivalized disposable income is substantially higher than suggested by comparable survey based analyses (about .35 versus less than .30).

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# Outlook

- The tax data from Bern are not perfect. For example, information on social assistance is missing and the analytic potential is limited due to lack of interesting covariates (say, education).
- We just received a grant last week for a new project.
- In this project, cantonal tax records will be linked with ...
  - ▶ ... the population registry
  - ▶ ... social security data
  - ▶ ... the Swiss structural surveys (yearly surveys of about 250'000 residents on topic such as household and family, employment, education, etc.)
  - ▶ ... several further administrative datasets and surveys
- The new database will allow accurate analyses of the economic situation (including assets) of households and individuals, and it will come with a rich set of covariates.

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